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Influence of body structure types and pronouncement of meat forms of bulls on their sexual activity

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Abstract. The relevance of the study is determined by the need to find ways to improve the attributes of the reproduction of bulls that affect the economic efficiency of their use. The purpose of the study was to identify the relationship between the features of the exterior of bulls and their sexual activity, other signs of reproduction. Bulls of the Ukrainian meat breed were divided into two groups using the size Index: large-sized and compact. The pronouncement of meat forms in bulls was determined at the age of 15 months on a 60-point scale. Sexual activity was characterised by the duration of the manifestation of sexual reflexes from bringing the animal to the mount to mounting it. In experimental bulls, the duration of the period of productive use, the number of deliveries to the mount and attempts of mounting it, and the number of ejaculates received and culled were recorded. It was found that the tendency to distribute active moderate and calm manifestations of sexual reflexes in bulls of different types of body structure and the development of meat forms are similar. Most of all, there was a proportion of moderate sexual activity, but specific trends were observed within the groups. The proportion of high sexual activity was higher in compact bulls compared to large-sized peers and animals with better pronounced meat forms. Further, large-sized bulls tend to increase the duration of productive use, predominate in the proportion of mounts made and are characterised by a decrease in the proportion of ejaculate culling. Bulls with more pronounced meat forms tend to increase the duration of productive use, which is due to their higher breeding value based on the characteristics of meat productivity. In terms of the proportion of mounts made and the percentage of ejaculates culled, there was no difference between animals with different meat forms. The results obtained prove that compact bulls are more suitable for intensive use at an early age, and large-sized producers are more effective in adulthood. The better development of meat forms somewhat reduces the sexual activity of young bulls. At a more mature age, meat forms practically do not affect the results of using bulls. The results obtained allow selecting the type of body structure of bulls that have the highest sexual activity

Keywords: libido, meat cattle, artificial vagina, ejaculate

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Relevance

The problem of the reproduction of meat cattle is becoming increasingly urgent in animal husbandry. During the creation of the Ukrainian meat breed, artificial insemination of females was used by a complex reproductive crossing of the Kian, Charolez, Simmental, and grey Ukrainian breeds. The use of 4 breeds with different exteriors led to the production of new genotypes of animals with different types of body structures and the pronouncement of meat forms. The sexual activity of bulls also varied substantially, which sometimes led to inefficient use of males and high cost of sperm and calves. Getting bulls with a high libido can make it easier to manage cattle breeding.

Analysis of Literature Sources

Bulls are evaluated according to the signs of reproduction, which are divided (Savchuk, 1985) into indirect (anatomical structure of the genitals, size of the testes, girth of the scrotum, age of puberty, severity of sexual dimorphism) and direct (sexual activity, sperm productivity, fertilising ability of sperm). The physiological maturity of bulls lasts from 2 to 5 years of age (Naumenko *et al.*, 2009). In addition to the desired origin, exterior and constitution, the producer must show high sexual activity and produce high-quality sperm. During natural mating or receiving sperm for artificial insemination, producers exhibit five basic sexual unconditioned reflexes: attraction, hugging, erection, mating, and ejaculation. Sexual desire and hugging reflex bulls show not only on the female but also on the mount, which ensures the receipt of sperm in the artificial vagina. Not all producers give a quick mounting, which is manifested by conditioned reflexes. It is known that the sexual behaviour of producers is not affected by their sperm mass and physical and morphological aspects (De Oliveira *et al.*, 2007). It is influenced by the parameters of the testes, which

are determined by measuring and calculating the volume of the scrotum (Gippolito *et al.*, 2019).

The sexual behaviour of a bull during natural mating does not always coincide with the manifestation of libido in the arena. Sexual activity can be affected by the dominance of other producers and stress, which worsens the final results. Bulls that have a strong libido manifestation provide a higher level of pregnancy and sperm production output compared to low and medium manifestation (Islam *et al.*, 2018), so it is important to identify bulls with low activity of sexual behaviour in the arena when taking sperm into the artificial vagina. The problem of increasing the sexual activity of bulls and the quality of their sperm production is recommended (Kozyr & Barabash, 2018) to be solved by mechanical pressure and electrical stimulation of erogenous zones. The earliest manifestation of puberty and sexual behaviour in bulls is being investigated as one of the new features that allow for accelerated animal use (da Silva Neto *et al.*, 2020). In turn, the sexual activity of animals is associated with the breed (Rehman *et al.*, 2016) or a genetic group of animals (Schenk, 2018). Sexual behaviour depends not only on the individual characteristics of the bull, but also on the conditions of its use. The addition of variable factors can improve libido (Schenk, 2018), although the activity of sexual reflexes depend on the season of the year (Rinku *et al.*, 2019; Piddubna, Zakharchuk, 2020).

Some signs of the performance of bulls are also associated with the manifestation of libido. In the Ongole grade breed (Affandhy *et al.*, 2018) it was identified that young bulls have higher sexual activity and sperm quality at the intermediate live weight. In the complex of measures to improve the breeding value of meat bulls, the emphasis is placed on the choice of animals with a large live weight of the desired type of body structure, which most corresponds to the productive area of the livestock. Animals of compact

and large-sized types are distinguished by type. During their selection, special attention is paid to the pronouncement of meat forms. Previously, it was identified that large-sized bulls are characterised by a large volume of ejaculate and the number of spermatozoa with rectilinear translational movement in it, and large-sized bulls with better-expressed meat forms show a decrease in the volume of ejaculate, the concentration of sperm in one ML and their fertilising ability (Koropets, Ugnivenko, 2019).

Since the type of body structure and the development of musculature and subcutaneous adipose tissue are associated with metabolic processes in the animal's body, they may be associated with the activity of sexual reflexes.

The purpose of the study was to establish the manifestation of sexual activity and features of the reproductive ability of bulls of the Ukrainian meat breed of various types of body structure and the severity of meat forms when receiving sperm in an artificial vagina.

Material and Research Methods

The study was conducted at the Volia breeding plant in the Zolotynskyi District of the Cherkasy region. Until the age of 8 months, the bulls were suckled, after which they were tested for their own productivity. During the test, they investigated sexual behaviour by taking sperm on an artificial vagina, the type of body structure and pronouncement of meat forms, and signs of reproductive ability. A mount was used to test the libido of bulls in the arena. Bulls were tested individually and classified into three main degrees of sexual activity (active, calm, and moderate). Active (A) – a high degree of sexual activity was characterised by a short duration (from 10 to 60 seconds) of all sexual reflexes to mount. Moderate (M) – the degree of manifestation of sexual activity was characterised by a slightly longer course of reflexes. It lasted

from 60 to 120 seconds. Calm (C) – a relatively low degree of sexual activity, in which the time from the animal to the mount to the attempt of mounting lasted more than 120 seconds.

Receiving sperm from bulls started at the age of 12 months. From the age of 14 months, they were used to get ejaculate once a week. Two ejaculates (double mounts) were taken from young bulls up to 18 months old, and up to four ejaculates per week were taken from adults. After taking sperm on an artificial vagina, the volume of ejaculate and the concentration and motility of sperm were evaluated in bulls.

The conditional compactness or large stature of bulls was determined according to the method proposed by the study (Ugnivenko *et al.*, 2010). It is based on the size index determined based on the oblique length of the body with a stick and the height in the sacrum. Based on the comparison of the index distribution, two conditional types were distinguished: large-sized (large-sized and long-bodied) and compact (short-sized and short-bodied). The pronouncement of meat forms of bulls was determined at 15 months of age on a 60-point scale (Prakhov *et al.*, 1990). Animals on this basis were divided into two groups – the better pronouncement (the score is higher than the average for the group of experimental bulls) and the worse pronouncement (the score is lower than the average).

Results and Discussion

Sexual activity and features of the use of bulls do not depend much on the type of structure of their body and the pronouncement of meat forms. In large-sized and compact bulls, there is a tendency to reduce the active and calm degrees of reflex manifestation, but this substantially increases the number of producers with a moderate degree of sexual activity (Table 1). The proportion of high sexual activity tends to increase in compact bulls compared to large-sized peers.

Table 1. Sexual activity of bulls with different types of body structure and pronouncement of meat forms

Feature	Degree of activity	Body structure type		Pronouncement of meat forms	
		large-sized (n=9)	compact (n=10)	better (n=20)	worse (n=20)
		<i>M±m</i>	<i>M±m</i>	<i>M±m</i>	<i>M±m</i>
Proportion of degrees of sexual activity, %	A	7.6±0.5	12.2±1.1	8.4±0.2	12.3±0.4
	M	71.3±4.9	69.4±4.6	71.4±2.1	69.7±1.9
	C	21.1±2.1	24.4±2.0	20.2±1.0	18.0±0.9

This is due to the fact that compact forms are characteristic of more precocious animals. That is, they reach physiological maturity at an earlier age, which to a certain extent has a positive effect on sexual activity. Large stature slows down puberty.

For more pronounced meat forms, which are evaluated on a 60-point scale, the best rating is also given to bulls with accelerated adipose tissue growth. The development of obesity contributes to a decrease in sexual activity. This affected the fact that the share of active

manifestations of sexual reflexes that show libido in bulls with better pronounced meat forms is 4.1% less. Although the overall distribution of the frequency of sexual activity of bulls with different development of meat forms is similar, this trend must be considered.

Large-sized bulls tend to increase the number of leads to the mount and mountings on the artificial vagina. They have a longer duration of productive use (Table 2). Therewith, large-sized producers are characterised by a decrease in the proportion of ejaculate culling.

Table 2. Features of using bulls for different types of body structure

Feature	Body structure type		Pronouncement of meat forms	
	large-sized (n=9)	compact (n=10)	better (n=20)	worse (n=20)
	<i>M±m</i>	<i>M±m</i>	<i>M±m</i>	<i>M±m</i>
Number of leads to the mount, times	214±32.1	154±28.1	164±21.3	125±15.6
Number of completed mounts, times	196±27.0	120±25.8	135±19.2	99±14.7
Share of made mounts, %	80.3±4.2	71.8±7.5	82.3±2.4	79.2±3.4
Ejaculate culled, %	13.7±2.3	19.3±4.7	8.1±2.4	9.3±3.2
Duration of productive use of bulls, days	672±102.8	531±87.1	550±72.6	416±47.0

Bulls with pronounced meat forms tend to increase the number of leads and mountings and the duration of productive use. This is to some extent due to their higher breeding value in terms of meat productivity. In terms of the proportion of mounts made from the total number of leads and the percentage of ejaculates culled, there is practically no difference between animals with different manifestations of meat forms. Thus, there were no grounds for limiting the use of bulls with good muscle and subcutaneous tissue development due to

the deterioration of signs of their reproductive ability. In turn, the compact type of bull, which is associated with the tendency to the precocity of animals, may have a slightly worse quality.

Conclusions and Prospects

In large-sized young bulls, a decrease in the share of active manifestation of sexual reflexes is observed in comparison with compact ones, which is due to their relatively late maturation, but during the period of productive use, these animals show a tendency to increase the share of mounts

made and a decrease in the number of ejaculates culled. Bulls with better pronounced meat forms during the test tend to reduce the proportion of leads to the mount with an active manifestation of sexual reflexes. Further, there is no

difference in the proportion of mounts made and high-quality ejaculates between bulls with different development of meat forms, but the breeding value of meat productivity affects the duration of lifelong use.

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Вплив типів будови тіла та вираженості м'ясних форм бугаїв на їх статеву активність

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Анотація. Актуальність досліджень визначена необхідністю пошуку шляхів поліпшення ознак відтворення бугаїв, які впливають на економічну ефективність їх використання. Метою дослідження було виявити зв'язок між особливостями екстер'єру бугаїв і їх статевою активністю та іншими ознаками відтворення. Бугаїв української м'ясної породи з використанням індексу великорослості розділяли на дві групи: великорослі та компактні. Вираженість м'ясних форм у бугайців визначали в 15-місячному віці за 60-бальною шкалою. Статеву активність характеризували за тривалістю прояву статевих рефлексів від підведення тварини до опудала до садки на нього. У дослідних бугаїв фіксували тривалість періоду продуктивного використання, кількість підведень до опудала і спроб садок на нього та кількість отриманих і вибракуваних еякулятів. Було встановлено, що тенденція розподілу активного помірною і спокійного прояву статевих рефлексів у бугайців різних типів будови тіла і розвитку м'ясних форм подібна. Найбільше була частка помірною прояву статевої активності, але в межах груп спостерігались специфічні тенденції. Частка прояву високої статевої активності була більша у компактних бугайців проти великорослих ровесників і тварин з краще вираженими м'ясними формами. Надалі великорослі бугаї мають тенденцію до збільшення тривалості продуктивного використання, переважають за часткою зроблених садок та характеризуються зменшенням частки вибракування еякулятів. Бугайці за краще виражених м'ясних форм мають тенденцію до збільшення тривалості продуктивного використання, що обумовлено їх вищою племінною цінністю за ознаками м'ясної продуктивності. За часткою зроблених садок та відсотком вибракуваних еякулятів різниці між тваринами з різним проявом м'ясних форм не виявлено. Отримані результати доводять, що для інтенсивного використання в ранньому віці більш придатні бугайці компактного типу, а в зрілому віці більш ефективні великорослі плідники. Кращий розвиток м'ясних форм дещо знижує статеву активність молодих бугаїв. У більш зрілому віці на результати використання бугаїв м'ясні форми практично не впливають. Отримані результати дозволяють добирати за типом будови тіла бугаїв, які мають найвищу статеву активність

Ключові слова: лібідо, м'ясна худоба, штучна вагіна, еякулят